

REMARKS/ARGUMENTS

Claims 24-73 are pending. By this Amendment, new claims 60-73 are presented. Support for new claims 60-73 can be found, for example, in the present specification at page 7, lines 11 to 14, and in previously presented claims 45-58. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Allowable Subject Matter

Applicants thank the Examiner for the indication in the Office Action that claims 24-44 and 59 recite allowable subject matter.

Declaration

Applicants have attached hereto a Declaration Under 37 C.F.R. §1.132 in support of the patentability of the present claims.

Rejection Under 35 U.S.C. §102

The Office Action rejects claims 45-49, 53, 56 and 58 under 35 U.S.C. §102(b) over Lilley et al. ("Precipitation in LiF Crystals Doped with MgF<sub>2</sub>") ("Lilley"). Applicants respectfully traverse the rejection.

Claim 45 recites "[a] single-crystal lithium fluoride doped with 0.023 to 0.082 mol per kg of a divalent positive ion M present in the fluorinated state" (emphasis added). Lilley does not disclose or suggest such a single-crystal lithium fluoride.

As indicated above, claim 45 requires single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state. The Office Action asserts that Lilley

discloses single-crystal lithium fluoride doped with MgF<sub>2</sub>. *See* Office Action, page 2.

Applicants respectfully disagree.

At the outset, the amounts of MgF<sub>2</sub> in Lilley are outside of the scope of claim 45.

Referring to the closest disclosed amounts of MgF<sub>2</sub> in Lilley (*see, e.g.*, page 571), 0.045 mol% MgF<sub>2</sub> is equivalent to 0.017 mol M/kg, which is outside the range of claim 45, and 0.225 mol% MgF<sub>2</sub> is equivalent to 0.085 mol of M/kg, which is outside of the range of claim 45. Accordingly, with respect to M content, the two closest examples in Lilley fail to satisfy claim 45.

Lilley discloses that "[i]n order to study the morphology of the metastable phase, replicas were made of a crystal of LiF/0.225 mol% MgF<sub>2</sub>, which had been slowly cooled and was known, from X-ray diffraction observations, to contain the metastable phase but no stable MgF<sub>2</sub>." *See* Lilley, page 572. Lilley describes a similar effect in a sample including 0.045 mol% MgF<sub>2</sub>: "this same phase was also formed in slowly cooled crystals containing 0.045 and 0.225 mol% MgF<sub>2</sub>." *See* Lilley, page 571.

Applicants again emphasize that claim 45 requires single-crystal lithium doped with MF<sub>2</sub>. As is evident from the above-quoted passages of Lilley, the crystals of Lilley include an LiF phase and an MgF<sub>2</sub> phase. *See* Declaration, paragraph 7. This structure, including separate LiF and MgF<sub>2</sub> phases, is not a single crystal as required in claim 45. *See* Declaration, paragraph 7.

To further emphasize this point, Applicants undertook further experimentation to demonstrate that the structure of the crystal of claim 45 is different from the structure of the crystals described in Lilley. The experimentation is described in the Declaration.

A single crystal of LiF doped with Mg in fluoride form was prepared from a blend of pure LiF and pure MgF<sub>2</sub> powders. *See* Declaration, paragraph 8. The blend was placed in a platinum crucible and then melted by heating. *See* Declaration, paragraph 8. A

crystallization operation was then carried out, resulting in a single crystal. *See Declaration*, paragraph 8. The obtained single crystal of LiF doped with Mg in fluoride form was determined to include 0.041 mol Mg/kg, which is clearly within the range recited in claim 45. *See Declaration*, paragraph 8. The obtained single crystal of LiF doped with Mg in fluoride form was examined by X-ray diffraction. *See Declaration*, paragraph 8. Examination of the obtained single crystal of LiF doped with Mg in fluoride form revealed that the single crystal did not include a stable or metastable MgF<sub>2</sub> phase. *See Declaration*, paragraph 8.

One of ordinary skill in the art would understand from the teachings of Lilley and the additional experimentation described above that the crystals of Lilley are not single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state, while the crystal of claim 45 and the crystals described in the present specification are single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state. *See Declaration*, paragraph 9.

As Lilley fails to disclose or suggest single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state, Lilley fails to disclose or suggest each and every feature of claim 45.

As explained, claim 45 is not anticipated by Lilley. Claims -49, 53, 56 and 58 depend from claim 45 and, thus, also are not anticipated by Lilley. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

#### Rejection Under 35 U.S.C. §103

##### A. Lilley and Khulugurov

The Office Action rejects claims 50 and 52 under 35 U.S.C. §103(a) over Lilley in view of Khulugurov et al. ("Laser active F-aggregate colour centres in LiF monocrystals

doped by divalent impurity cations") ("Khulugurov"). Applicants respectfully traverse the rejection.

For the reasons discussed above, Lilley fails to disclose or suggest each and every feature of claim 45. Khulugurov fails to remedy the deficiencies of Lilley. Khulugurov is cited for its alleged disclosure of an LiF crystal doped with  $\text{Co}^{2+}$ . *See* Office Action, pages 3 to 4. However, Khulugurov, like Lilley, fails to disclose or suggest single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state as recited in claim 45. Accordingly, the combination of Lilley and Khulugurov fails to disclose or suggest each and every feature of claim 45.

As explained, claim 45 would not have been rendered obvious by Lilley and Khulugurov. Claims 50 and 52 depend from claim 45 and, thus, also would not have been rendered obvious by Lilley and Khulugurov. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Lilley and Gupta

The Office Action rejects claim 51 under 35 U.S.C. §103(a) over Lilley in view of Gupta et al. ("Electrical conductivity studies of cobalt-precipitation in RbCl crystals") ("Gupta"). Applicants respectfully traverse the rejection.

For the reasons discussed above, Lilley fails to disclose or suggest each and every feature of claim 45. Gupta fails to remedy the deficiencies of Lilley. Gupta is cited for its alleged disclosure of an LiF crystal doped with  $\text{Zn}^{2+}$ . *See* Office Action, page 5. However, Gupta, like Lilley, fails to disclose or suggest single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state as recited in claim 45. Accordingly, the combination of Lilley and Gupta fails to disclose or suggest each and every feature of claim 45.

As explained, claim 45 would not have been rendered obvious by Lilley and Gupta. Claim 51 depends from claim 45 and, thus, also would not have been rendered obvious by Lilley and Gupta. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

C. Lilley

The Office Action rejects claims 54 and 55 under 35 U.S.C. §103(a) over Lilley. Applicants respectfully traverse the rejection.

For the reasons discussed above, Lilley fails to disclose or suggest each and every feature of claim 45. Accordingly, claim 45 would not have been rendered obvious by Lilley. Claims 54 and 55 depend from claim 45 and, thus, also would not have been rendered obvious by Lilley. Reconsideration and withdrawal of the rejection are respectfully requested.

D. Lilley and Wittry

The Office Action rejects claim 57 under 35 U.S.C. §103(a) over Lilley in view of U.S. Patent No. 4,882,780 to Wittry ("Wittry"). Applicants respectfully traverse the rejection.

For the reasons discussed above, Lilley fails to disclose or suggest each and every feature of claim 45. Wittry fails to remedy the deficiencies of Lilley. Wittry is cited for its alleged disclosure of a fluoride having a surface that is ground, treated in an acidic medium and/or polished. *See* Office Action, page 7. However, Wittry, like Lilley, fails to disclose or suggest single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state. Accordingly, the combination of Lilley and Wittry fails to disclose or suggest each and every feature of claim 45.

As explained, claim 45 would not have been rendered obvious by Lilley and Wittry.

Claim 57 depends from claim 45 and, thus, also would not have been rendered obvious by Lilley and Wittry. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

New Claims

By this Amendment, new claims 60-73 are presented. New claim 60 recites "[a] single-crystal lithium fluoride doped with 0.023 to 0.082 mol per kg of a divalent positive ion M present in the fluorinated state, wherein essentially all M ions are in the single-crystal cation lattice." New claim 60 is directed to a single-crystal lithium fluoride doped with a divalent positive ion M present in the fluorinated state and, thus, is believed to be patentable for at least the reasons discussed above with respect to claim 45. New claim 60 further requires that essentially all M ions are in the single-crystal cation lattice. As all M ions are within the single-crystal cation lattice, none can be in a separate MF<sub>2</sub> phase, as in the case of Lilley. For the foregoing reasons, claim 60 is believed to be patentable. Claims 61-73 depend from claim 60 and, thus, are also believed to be patentable.

Conclusion

For the foregoing reasons, Applicants submit that claims 24-73 are in condition for allowance. Prompt reconsideration and allowance are respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

Norman F. Oblon

Jacob A. Doughty  
Registration No. 46,671

Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 08/07)

Attachment:

Declaration Under 37 C.F.R. §1.132